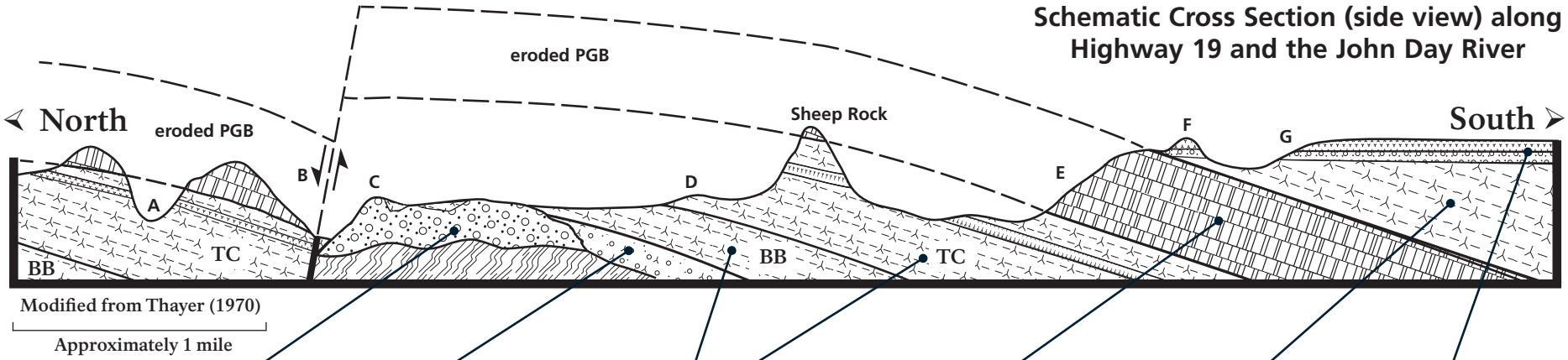
Sheep Rock Geology

National Park Service
U.S. Department of the Interior

John Day Fossil Beds National Monument
www.nps.gov/joda

Schematic Cross Section (side view) along Highway 19 and the John Day River



Goose Rock Conglomerate
This rock formed when much of Oregon was still ocean floor. The well-rounded and diverse rocks within the matrix suggest a high energy river emptied into the ocean here approximately 90 million years ago.

Clarno Formation
The Clarno is made up of volcanic ash falls, mudflows (lahars), and lava deposits. A lush semi-tropical rainforest dominated the landscape while these rocks were forming 54 to 40 million years ago. Due to ancient topography and erosion, rocks of this formation only occasionally appear at the surface within the Sheep Rock unit.

John Day Formation
The members of this formation are made primarily of ash fall material from the ancestral Cascades. Near Sheep Rock the red claystones of the Big Basin Member (BB) can be seen below the distinct blue-green Turtle Cove Member (TC), which includes the prominent greenish brown Picture Gorge Ignimbrite. Temperate hardwood forests and open woodlands dominated the area from 40 million to 18 million years ago. Grasses appear in the area during the late part of this period.

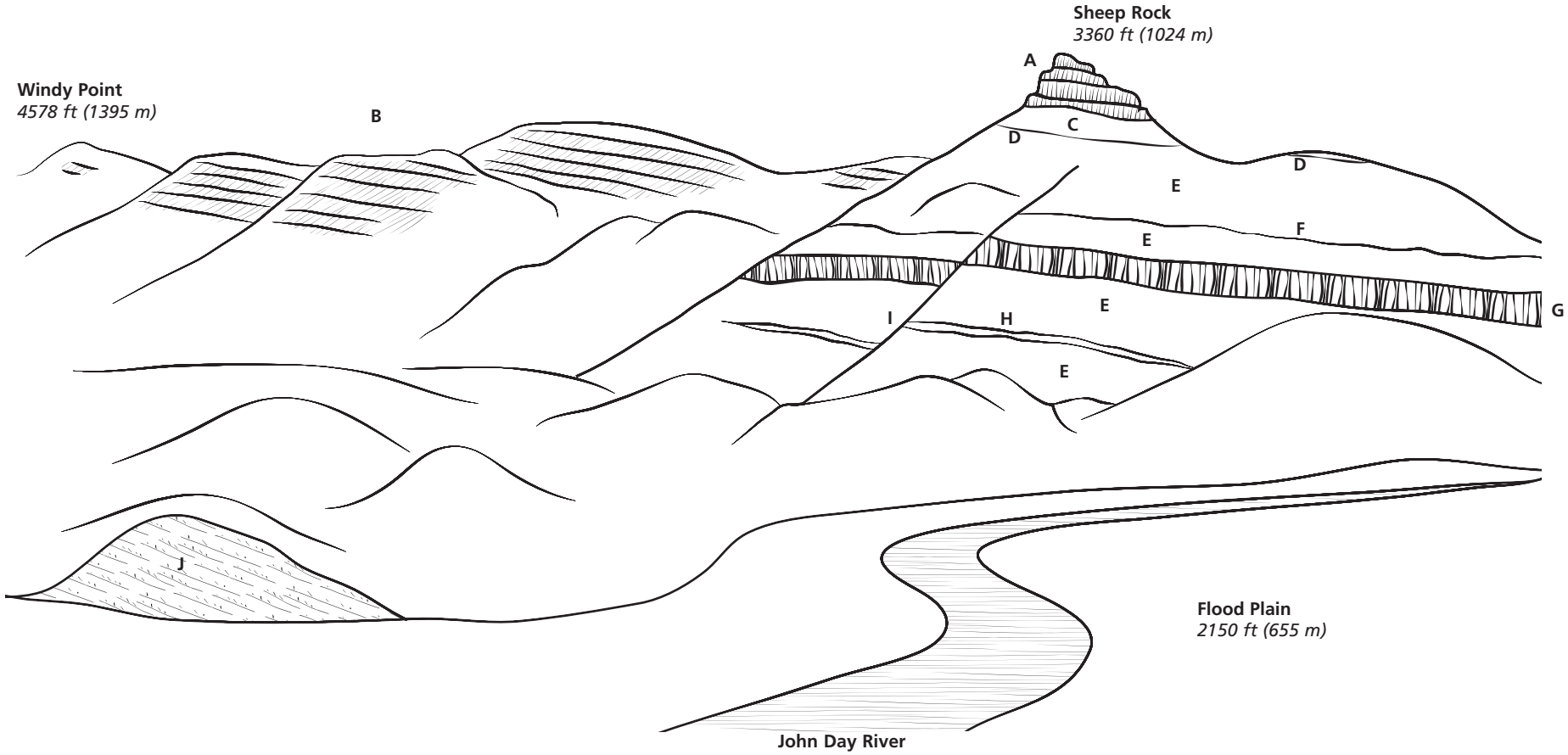
Picture Gorge Basalts
A series of 61 lava flows erupted from fissures in the earth's crust 16 million years ago. They covered approximately 2,500 square miles. Some flows were over 50 feet deep and flowed over the land at up to 30 miles per hour, incinerating all life. These are a subgroup of the Columbia River Basalts, which include hundreds of flows in the Pacific Northwest.

Mascall Formation
Consisting of ash fall deposits from volcanoes to the south, east, and west, this deposition occurred 15 to 12 million years ago when savannas dominated the area.

Rattlesnake Formation
The Rattlesnake is comprised of conglomeratic material from nearby mountains that eroded into grassy valley floors as well as ash fall deposits from volcanoes to the south. It formed 8 to 5 million years ago in a steppe environment, similar to today. The most notable of these is the Rattlesnake Ash Flow Tuff (RAFT) that forms the horizontal, mesa-like cap rock seen on hills above the John Day Valley.

A. Blue Basin
B. Middle Mountain Fault Zone
C. Goose Rock
D. Thomas Condon Paleontology Center and Cant Ranch
E. Picture Gorge is cut through the Picture Gorge Basalts in this area
F. Mesa topped by Rattlesnake Ash Flow Tuff
G. Mascall Overlook

- Interbedded claystone and tuff
- Conglomerate
- Lahar
- Basalt
- I gnimbrite
- Mesozoic metamorphic basement rocks



A. Sheep Rock capstone is a remnant of 16 million year old Picture Gorge Basalts.

B. Ridgelines also topped by Picture Gorge Basalts.

C. Tan and pink claystones and siltstones of the Kimberly Member of the John Day Formation, 26 to 24 million years old.

D. Tin Roof Tuff, 25.9 million years old.

E. Blue-green and tan claystones and siltstones of the Turtle Cove Member of the John Day Formation, 32 to 26 million years old.

F. Deep Creek Tuff, 27.9 million years old.

G. Greenish brown Picture Gorge Ignimbrite layer, 28.7 million years old. Appears reddish in some other locations, such as the top of Cathedral Rock.

H. Whitish Blue Basin Tuff, 28.8 million years old.

I. Small fault line running diagonally through Sheep Rock. Note the offset layers to each side.

J. Red claystones of the Big Basin Member of the John Day Formation, 32-40 million years old.